**Indicative simplified baseline and monitoring methodologies
for selected small-scale CDM project activity categories**

TYPE III - OTHER PROJECT ACTIVITIES

~~All the approved small-scale methodologies, general guidance to the methodologies, information on additionality and abbreviations can be found at: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html~~ Project participants must take into account the general guidance to the methodologies, information on additionality, abbreviations and general guidance on leakage provided at http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html .

III.I. Avoidance of methane production in wastewater treatment through replacement of anaerobic lagoons by aerobic systems

Technology/measure

1. This project category comprises measures that avoid the production of methane from biogenic organic matter in wastewaters being treated in anaerobic lagoons. Due to the project activity, the anaerobic lagoons[1] (without methane recovery), are substituted by aerobic systems. The project activity does not recover or combust methane in wastewater treatment facilities (unlike III H).~~Measures shall both reduce anthropogenic emissions by sources, and directly emit less than 15 kilo tonnes of carbon dioxide equivalent annually.~~

2. This category is applicable for project activities resulting in annual emission reductions lower than 25,000 ton CO_2e. If the emission reduction of a project activity exceeds the reference value of 25,000 ton CO_2e in any year of the crediting period, the annual emission reduction for that particular year is capped at 25,000 ton CO_2e.

Boundary

3. The project boundary is the physical, geographical site where the wastewater treatment takes place.

Project Activity ~~Direct~~ Emissions

4. ~~Total annual project activity related emissions shall be less than or equal to 15 kilo tonnes of CO_2 equivalent~~. Project activity emissions consists of:

(i) CO_2 emissions related to the power used by the project activity facilities. Emission factors for grid electricity or diesel fuel use shall be calculated as described in category I.D;

(ii) Methane emissions during the aerobic wastewater treatment;

[1] Anaerobic lagoons are ponds deeper than ~~1~~2 meters, without aeration, temperature above 15^{0}C, at least during part of the year, on a monthly average basis, and with a volumetric loading rate of Chemical Oxygen Demand above 0.1 kg COD/(m3.day).

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(iii) Methane emissions from the decay of the sludge generated by the aerobic systems, if the sludge is ~~left~~ disposed to decay anaerobically ~~and disposed~~ in a landfill without methane recovery.

$$PE_y = PE_{y,power} + PE_{y,ww,treatment} + PE_{y,sludge}$$

Where:

PE_y:	project activity emissions in the year “y” (tCO_2e)
$PE_{y,power}$	emissions on account of electricity or diesel consumption in the year “y”
$PE_{y,ww,treatment}$	emissions from the aerobic wastewater treatment in the year “y”[1]
$PE_{y,sludge}$	emissions from anaerobic decay of the sludge produced in the year “y”

$$PE_{y,ww,treatment} = Q_{ww,y} * COD_y * Bo * MCF_{aerobic} * GWP\_CH_4$$

Where:

$Q_{ww,y}$	Volume of the wastewater treated during the year “y” (m^3)
COD_y	Chemical oxygen demand of effluent entering the lagoons in the year y (tonnes).
B_o	methane producing capacity for the wastewater (IPCC default value for domestic wastewater of 0.21 kg CH_4/kg.COD)[2]
$MCF_{aerobic}$	methane correction factor for the wastewater treatment in aerobic systems (MCF higher value of 0.1 for well managed systems, or 0.4 for poorly managed or overloaded systems as per table III.H.1 in category III.H)
GWP_CH_4	Global Warming Potential for CH_4 (value of 21)

$$PE_{y,sludge} = S_y * DOC_{y,s} * MCF_s * DOC_F * F * 16/12 * GWP\_CH_4$$

Where:

$PE_{y,sludge}$	Methane emissions from the anaerobic decay of the final sludge generated in the wastewater system in the year “y” (tCO_2e)
S_y	Amount of sludge generated by the wastewater treatment in the year y (tonnes).
$DOC_{y,s}$	Degradable organic content of the sludge generated by the wastewater treatment in the year y (fraction). It shall be measured by sampling and analysis of the sludge produced, and estimated ex-ante using the IPCC default values of 0.05 for domestic sludge (wet

[1] These methane emissions occur due to anaerobic pockets that may occur in aerobic systems, and are considered in 2006 IPCC Guidelines. Methane emissions through inefficiency of the wastewater treatment and presence of degradable organic carbon in treated wastewater will be neglected, since they would also be accounted for in the baseline scenario, and would approximately cancel each other.

[2] The IPCC default value of 0.25 kg CH_4/kg COD was corrected to take into account the uncertainties. For domestic waste water, a COD based value of $B_{o,ww}$ can be converted to BOD_5 based value by dividing it by 2.4 i.e. a default value of 0.504 kg CH_4/kg BOD can be used.

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basis, considering a default dry matter content of 10 percent) or 0.09 for industrial sludge (wet basis, assuming dry matter content of 35 percent). ~~Degradable organic content of the sludge generated by the wastewater treatment in the year y (mass fraction). It can be measured by sampling and analysis of the sludge produced, or the IPCC default value for solid wastes of 0.3 is used.~~

MCF_s	Methane correction factor of the landfill that receives the final sludge, estimated as described in category AMS III.G.
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value is 0.5 ~~0.77~~).
F	Fraction of CH_4 in landfill gas (IPCC default is 0.5).

Baseline

5. The baseline scenario is the situation where, in the absence of the project activity, degradable organic matter in wastewater is treated in anaerobic lagoons and methane is emitted to the atmosphere. Baseline emissions are calculated as the amount of methane produced in the anaerobic system that was replaced with aerobic system.

6. The baseline emissions from the lagoon are estimated using the procedure defined under category AMS III.H. ~~the chemical oxygen demand (COD) of the effluent that would enter the lagoon in the absence of the project activity, the maximum methane producing capacity (Bo) and a methane conversion factor (MCF) that expresses what proportion of the effluent would be anaerobically digested in the open lagoons. These CH_4 emissions from wastewater should shall be calculated according to the IPCC Guidelines as follows~~:

$$BE_y = \sum(Q_{ww,y,m} * COD_{y,m}) * Bo * MCF_{lagoon} * GWP\_CH_4$$

Where:

BE_y	Baseline emissions in the year “y” (tCO_2e).
$Q_{ww,y,m}$	Volume of the wastewater treated during the months m, during year “y”, for the months with average lagoon temperature above 15°C (m^3)
$COD_{y,m}$	Chemical oxygen demand of effluent entering the lagoons in the year y (tonnes/m^3) for the months with average lagoon temperature above 15ºC. It shall be directly measured, since the effluent that goes into the lagoon in the baseline situation is the same as the one that goes into the aerobic system in the project situation.
MCF_{lagoon}	methane correction factor for the wastewater treatment in anaerobic lagoons (MCF lower value of 0.8 as per table III.H.1 under AMS III.H).
~~Bo~~	~~Maximum methane producing capacity. A value of 0.21 kg CH4/kg COD is used.~~
~~MCF~~	~~Methane conversion factor (fraction). The MCF default value to be adopted for projects in Africa, Asia and Latin America & Caribbean shall be 0.738, and for North America, Australia and New Zealand shall be 0.574.~~
~~GWP_CH4~~	~~Global Warming Potential for CH4 (value of 21)~~

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Leakage

7. If the aerobic treatment technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage effects at the site of the other activity are to be considered.

Monitoring

8. The emission reduction achieved by the project activity will be measured as the difference between the baseline emission and the sum of the project emission and leakage.

$$ER_y = BE_y - (PE_y + Leakage_y)$$

Where:

ER_y Emission reduction in the year "y" (tCO_2e)

~~9.~~ The amount of COD treated in the wastewater treatment plant shall be measured regularly. The wastewater flow shall be recorded. ~~Through representative sampling and analysis, the COD content of the wastewater flowing to the treatment plant shall be recorded.~~

$$\cancel{COD_y = Q_{WW,y} * COD_{m,y}}$$

~~where:~~

~~COD_y~~	~~Chemical oxygen demand of effluent entering the wastewater treatment plant in the year "y" (tonnes).~~
~~$Q_{WW,y}$~~	~~Volume of wastewater treated by the plant in the year y (m^3).~~
~~$COD_{m,y}$~~	~~Average chemical oxygen demand of the effluent entering the wastewater treatment plant in the year y (tonnes/m^3).~~

10. The yearly amount of sludge produced (Sy) shall be directly measured by weight or indirectly by its volume and density. Its degradable organic content ($DOC_{y,s}$) will be measured by representative sampling and analysis, in case the default value is not used.